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**REMARKS**

The Final Office Action mailed on December 31, 2001, has been received and reviewed. Claims 33 through 37 and 41 through 56 are currently pending in the application. Claims 33 through 37 and 41 through 56 stand rejected.

It is proposed that each of independent claims 33, 43, and 49 be amended as presented herein.

Reconsideration of the above-referenced application is respectfully requested.

**Finality of Outstanding Office Action**

It is respectfully submitted that the finality of the outstanding Office Action is improper. The claims of the above-referenced application were last amended in an Amendment Under 37 C.F.R. § 1.116, which was filed on September 17, 2001. In an Advisory Action dated October 9, 2001, the Office refused to enter the amendments. Subsequently, on October 15, 2001, a Request for Continued Examination was filed with a request that the previously proposed amendment be entered in the above-referenced application. The Final Office Action is the first action that has been taken by the Office following the filing of the Request for Continued Examination.

With respect to the entry of final rejections in first office actions, M.P.E.P. § 706.07(b) provides:

[I]t would not be proper to make final a first Office action in a continuing or substitute application where that application contains material which was presented in the earlier application after final rejection or closing of prosecution . . .

M.P.E.P. § 706.07(h) indicates that these provisions also apply to Requests for Continued Examination.

Moreover, the Office has not indicated that the rejection presented in the outstanding Office Action is a first action final rejection of the claims.

For these reasons, it is respectfully requested that the finality of the outstanding Office Action be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Claims 33 through 37 and 41 through 56 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,672,542 Schwiebert et al. (hereinafter "Schwiebert").

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

Schwiebert teaches a reusable, metallic solder mask that may be aligned over a substrate. As shown in FIG. 5 of Schwiebert, apertures 330 of such a solder mask 544 are aligned over wettable regions 322, such as bond pads or terminals, on a surface 321 of a substrate 546. *See also*, col. 7, lines 38-49. Once the solder mask 544 has been used to form solder bumps on the wettable regions 322 of the substrate, the solder mask 544 is removed from the substrate. Col. 10, lines 34-44.

Schwiebert also teaches another solder mask that may be formed from a polymer, such as a photoimageable polyimide, a dry film photomask, or a liquid photoimageable photomask. Col. 6, lines 28-31. Of course, one of ordinary skill in the art would readily recognize that a solder mask formed from these photoimageable polymers would be formed *on the surface* of a substrate by applying a film of unconsolidated (*e.g.*, liquid or powder) photoimageable polymer to the surface of the substrate, then curing selected regions of the film of unconsolidated photoimageable polymer. Schwiebert does not include any description, teaching, or suggestion that the polymer solder masks described therein may be preformed or assembled with a substrate in the manner depicted in FIG. 5 of Schwiebert. Rather, that description is limited to metallic solder masks, as is evident from the teaching that "magnets 548 . . . hold the mask from below through magnetic attraction . . ." Col. 7, lines 39-41.

When the solder masks described in Schwiebert are used, spherical solder bumps, or balls, are formed. Col. 7, lines 56-57. Schwiebert does not include any description, teaching, or suggestion that the bumps formed by the masks described therein include apertures that are configured to define peripheral shapes of the conductive bumps.

*Schwiebert Does Not Teach or Suggest Each and Every Claim Element*

First, it is respectfully submitted that Schwiebert does not teach or suggest each and every element of any of claims 33 through 37 or 41 through 56.

Independent claim 33, as proposed to be amended herein, recites a *pre-formed solder mask* that includes, among other things, a film of solder mask material *that comprises a polymer* and at least one aperture formed therethrough. The fact that the solder mask of amended independent claim 33 is pre-formed is emphasized by the recitation that the solder mask is "*to be disposed*" (emphasis supplied) on a substrate. The at least one aperture is "configured to define a peripheral shape of a conductive structure to be formed . . ." therein.

In contrasting the teachings of Schwiebert with the subject matter recited in independent claim 33, it is quite clear that Schwiebert lacks any teaching or suggestion of a pre-formed solder mask that includes a polymer. Moreover, there is no teaching or suggestion in Schwiebert that the solder mask described therein includes at least one aperture "configured to define a peripheral shape of a conductive structure to be formed . . ." therein.

Accordingly, it is respectfully submitted that Schwiebert does not teach or suggest each and every element of amended independent claim 33, as is required to maintain a rejection under 35 U.S.C. § 103(a).

Each of claims 34 through 37, 41, and 42 is allowable, among other reasons, as depending from claim 33, which is allowable.

Independent claim 43, as proposed to be amended herein, also recites a *pre-formed solder mask* that comprises a film of solder mask material *that comprises a polymer*. The fact that the

solder mask of amended independent claim 43 is pre-formed is emphasized by the recitation that the solder mask is "*to be disposed*" (emphasis supplied) on a substrate. In addition, claim 43 recites that the film of non-metallic solder mask material includes "a surface configured to be adhered to a substrate . . ." The solder mask of claim 43 also includes at least one aperture that is "configured to define a peripheral shape of a conductive structure to be formed . . ." therein.

As explained previously herein, Schwiebert clearly lacks any teaching or suggestion of a pre-formed solder mask that comprises a polymer. Further, Schwiebert does not teach or suggest that a solder mask may comprise a film of solder mask material that comprises a polymer and which includes a surface "configured to be adhered to a substrate . . ." Rather, as is clear from fact that all of the polymers that are described in Schwiebert as being useful for forming solder masks are photoimageable polymers, Schwiebert suggests that a solder mask comprising a polymer would have to be formed on the surface of the substrate, rather than pre-formed, then adhered to the substrate. Moreover, there is no teaching or suggestion in Schwiebert that the solder mask described therein includes at least one aperture "configured to define a peripheral shape of a conductive structure to be formed . . ." therein.

Accordingly, it is respectfully submitted that Schwiebert does not teach or suggest each and every element of amended independent claim 43. It is, therefore, respectfully submitted that, under 35 U.S.C. § 103(a), amended independent claim 43 is allowable over Schwiebert.

Each of claims 44 through 48 is allowable, among other reasons, as depending from claim 43, which is allowable.

The semiconductor device assembly recited in independent claim 49, as proposed to be amended herein, includes, among other things, a substrate, a pre-formed film of solder mask material comprising a polymer on the substrate, and at least one open aperture formed through the pre-formed film. The at least one open aperture is located correspondingly to a contact pad of the substrate and is "configured to define a peripheral shape of a conductive structure to be formed therein."

By way of contrast with amended claim 49, Schwiebert lacks any teaching or suggestion of a pre-formed solder mask of a material comprising a polymer. Also, Schwiebert neither teaches nor suggests that any of the apertures of the solder masks described therein are "configured to define a peripheral shape of a conductive structure to be formed therein."

It is, therefore, respectfully submitted that Schwiebert does not teach or suggest each and every element of amended independent claim 49 and that, under 35 U.S.C. § 103(a), amended independent claim 49 is therefore allowable over Schwiebert.

Claims 50 through 56 are each allowable, among other reasons, as depending from claim 49, which is allowable.

*One of Ordinary Skill in the Art Would Not Have Been Motivated to Modify the Teachings of Schwiebert in the Asserted Manner*

Second, it is respectfully submitted that one of ordinary skill in the art would not have been motivated by either Schwiebert or the knowledge that was generally available in the art as of the priority date for the above-referenced application to have modified the teachings of Schwiebert in the manner that has been suggested in the outstanding Office Action.

Specifically, Schwiebert's discussion of the use of polymers to form a solder mask is limited to the use of a photoimageable material which would be used to form a solder mask directly on the surface of a substrate would not have motivated one of ordinary skill in the art to use a solder mask material comprising a polymer to pre-form a solder mask that may be subsequently applied to a substrate.

As Schwiebert includes no teaching or suggestion that would have motivated one of ordinary skill in the art to pre-form a solder mask from a solder mask material that comprises a polymer, it is respectfully submitted that any purported motivation to modify the teachings of Schwiebert in the manner that has been suggested could only have been based on the benefit of hindsight provided by the disclosure and claims of the above-referenced application.

*Schwiebert Teaches Away from the Asserted Modification, As Well As from the Claimed Subject Matter*

Third, it is respectfully submitted that by illustrating in FIGs. 3C and 7 and by teaching, at col. 7, lines 56-57, that solder balls formed using the solder masks described in Schwiebert are spherical in shape and do not have peripheries that are configured by the surfaces of the apertures of the solder mask, Schwiebert actually teaches away from the proposed modification thereof, as well as from the subject matter recited in claims 33 through 37 and 41 through 56.

In view of the foregoing, it is respectfully submitted that the Office has not established a *prima facie* case of the obviousness of claims 33 through 37 or 41 through 56 under 35 U.S.C. § 103(a). Accordingly, it is respectfully requested that the Office withdraw the 35 U.S.C. § 103(a) rejections of claims 33 through 37 and 41 through 56 as being unpatentable over Schwiebert.

**ENTRY OF AMENDMENTS**

It is respectfully submitted that the proposed amendments to claims 33, 43, and 49 should be entered because these amendments are supported by the as-filed specification and drawings. Moreover, it is respectfully submitted that none of these amendments introduces new matter into the above-referenced application. Moreover, it is respectfully submitted that entry of these amendments will neither raise new issues or require a further search. Further, each of the proposed amendments narrows the issues for purposes of appeal. Finally, if it is determined that the proposed amendments do not place the above-referenced application in condition for allowance, entry thereof is respectfully requested upon filing of a Notice of Appeal herein.

**CONCLUSION**

It is respectfully submitted that each of claims 33 through 37 and 41 through 56 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing the allowance of any of claims 33 through 37 and 41 through 56 remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully Submitted,



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Enclosure: Version with Markings to Show Changes Made  
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend the claims as follows:

33. (Twice amended) A pre-formed solder mask, comprising:  
a [layer] film of [non-metallic solder] mask material comprising a polymer and having a substantially uniform thickness; and  
at least one open aperture formed through said [layer] film and located within said film correspondingly to a contact pad location of a substrate upon which the pre-formed solder mask is to be disposed, said at least one open aperture configured to define a peripheral shape of a conductive structure to be formed on said contact pad.
35. (Twice amended) The pre-formed solder mask of claim 33, wherein said substantially uniform thickness of said [layer] film substantially corresponds to a desired height of said conductive structure.
36. (Amended) The pre-formed solder mask of claim 33, wherein said solder mask material [comprises] is a polymer.
37. (Twice amended) The pre-formed solder mask of claim 33, wherein said solder mask material is formulated to shrink or degrade [shrinks or degrades] upon exposure to at least one of radiation, a plasma, and a shrinking agent.
41. (Amended) The pre-formed solder mask of claim 33, wherein said [layer] film is configured to be adhered to a substrate.
42. (Twice amended) The pre-formed solder mask of claim 33, further comprising an adhesive on a surface of said [layer] film.

43. (Twice amended) A pre-formed solder mask, comprising:  
a [layer] film of [non-metallic] solder mask material comprising a polymer and having a substantially uniform thickness, said [layer] film including a surface configured to be adhered to a substrate; and  
at least one open aperture formed through said [layer] film and located within said film correspondingly to a contact pad location of a substrate upon which the pre-formed solder mask is to be disposed, said at least one open aperture configured to define a peripheral shape of a conductive structure to be formed on said contact pad.

45. (Twice amended) The pre-formed solder mask of claim 43, wherein said substantially uniform thickness of said [layer] film substantially corresponds to a desired height of said conductive structure.

46. (Amended) The pre-formed solder mask of claim 43, wherein said solder mask material [comprises] is a polymer.

47. (Amended) The pre-formed solder mask of claim 43, wherein said solder mask material is formulated to shrink or degrade [shrinks or degrades] upon exposure to radiation, a plasma, or a shrinking agent.

48. (Amended) The pre-formed solder mask of claim 43, wherein said surface of said [layer] film includes an adhesive material.

49. (Twice amended) A semiconductor device assembly, comprising:  
a substrate including at least one contact pad;  
a pre-formed [layer] film of [non-metallic] solder mask material comprising a polymer and disposed on said substrate, said pre-formed [layer] film having a substantially uniform thickness; and

at least one open aperture formed through said pre-formed [layer] film and located within said film correspondingly to said at least one contact pad, said at least one open aperture configured to define a peripheral shape of a conductive structure to be formed therein.

51. (Amended) The semiconductor device assembly of claim 50, wherein said conductive structure protrudes beyond an exposed surface of said pre-formed [layer] film.

53. (Amended) The semiconductor device assembly of claim 49, wherein said substantially uniform thickness of said pre-formed [layer] film is substantially equal to a height of said conductive structure.

54. (Amended) The semiconductor device assembly of claim 49, wherein said solder mask material [comprises] is a polymer.

55. (Amended) The semiconductor device assembly of claim 49, wherein said solder mask material is formulated to shrink or degrade [shrinks or degrades] upon exposure to at least one of radiation, a plasma, and a shrinking agent.

56. (Amended) The semiconductor device assembly of claim 49, wherein said surface of said pre-formed [layer] film includes an adhesive material.

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